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Patentanmeldung Nr. | Patent application No. | Demande de brevet n°

98401372.2

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Blatt 2 der Bescheinigung
Sheet 2 of the certificate
Page 2 de l'attestation

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THOMSON multimedia
92100 Boulogne Billancourt
FRANCE

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Method for accessing Internet services from a home network

The invention concerns a method for accessing Internet services, such as WEB pages, from a home network.

In a typical home bus network configuration, each device where a web access is provided, an entire IP stack is needed for allowing an access to Internet (through an Internet service provider for example). This approach is not very effective.

The invention concerns a method for accessing Internet services in a home network system comprising devices connected by a communication bus, said method comprising the steps of

- providing at least one device including a WEB interface, said device comprising an IP stack,
- making said WEB interface accessible to software element clients of other devices in said network through an application programmable interface.

According to an embodiment, said WEB interface splits responses to queries from software element clients into data packets corresponding to the memory capacity of said software element clients.

The Web Interface is considered as a function control manager (FCM) and offers an application programmable interface (API) to forward WEB protocol messages (for example HTTP messages) to/from a WEB server.

Other characteristics and advantages of the invention will appear through the description of a non-limiting embodiment of the invention, said description being made with reference to the enclosed figures, among which

- figure 1 is a block diagram of a home network linked to the Internet through a gateway,
- figure 2 is a flowchart of the establishment of an interactive application.

The following description uses a terminology defined in the following document, to which one should refer for further details: 'The HAVi Architecture - Specification of the Home Audio/Video interoperability (HAVi) Architecture' of May 11, 1998 Version 0.8 and publicly disclosed on May 15, 1998 on the WEB sites of at least the following companies: Sony, Philips, Toshiba, Sharp and Hitachi. Explanations and definitions regarding the terminology are also given at the end of the present description.

The aim of the WEB interface FCM is to provide a simple and a shareable means for HAVi devices to access to the WEB. Only one device contains the full IP stack : the gateway device (in **Erreur! Source du renvoi introuvable.**) where the WEB interface FCM resides. For client nodes where the WEB client software element resides (a WEB browser or the DCM manager) no IP stack is required. The software element client has to just find a WEB interface FCM in the HAVi network (using the REGISTRY service) and call the corresponding functions to send WEB requests (HTTP requests for example) through the messaging system.

The typical WEB protocol is HTTP. The present description is based on HTTP over TCP. However any request/response protocol which can be fit over an IP stack could be transported with the mechanism described.

The Gateway is any IAV or FAV device within the HAVi network which contains a WEB interface FCM. This FCM could be viewed as a proxy user agent as described in [2]. Moreover the gateway has to contain the IP stack and the means to access the Internet according to its architecture. The Internet access (see **Erreur! Source du renvoi introuvable.**) could be:

- a link to a service provider through the PSTN (using a modem),
- a link to service provider through a cable network (using a cable modem).

The WEB client is the software element which wants to reach an HTTP server (or WEB server). It could be a WEB browser (the WEB TV browser for example) or the DCM Manager which has to upload DCM (or DCM profile).

The WEB interface FCM offers an API which allows one or more client software elements to send transactions to a WEB server. Moreover a client could manage several concurrent transactions.

The way to map a client with the HTTP transaction (SEID and request identifier of the software element client could be mapped with a TCP connection) is vendor dependent.

The WEB protocol may be HTTP. The API offered by the WEB interface FCM could accept any changes of the HTTP specifications and even any other protocol compatible with the command/response paradigm.

The memory resources of the gateway may be limited. It means that according to the HTTP response size, this response may be forwarded to the requester using several HAVi messages. It is the responsibility of the requester to build the HTTP response from the messages received from the messaging system.

The WEB interface FCM may provide a response cachability according to [2] specification. The implementation will be vendor dependent and transparent for the API.

The memory resources of the client may be limited. Consequently, the WEB interface API has to offer a means to allow a client to give its maximum HAVi message buffer size. Therefore when a response will be processed, the WEB interface FCM will forward it using one or several messages according to the client memory capacity.

According to the present embodiment, the following commands are accepted by the Internet interface module:

(a) WEBInterface::SendRequest

Prototype

```
Status WEBInterface::SendRequest    (
                    in int request_id,
                    in int message_buffer_size,
                    in sequence <byte> web_request,
                    in short callback_selector
```

)

Parameters

request_id : this parameter allows the client to start several WEB transactions in parallel.

message_buffer_size : indicates the maximum size (in bytes) of a message accepted by the requester. The WEB Interface FCM will take into account that parameter during the sending of the response

web_request : Contains the WEB request according to the WEB protocol : HTTP for instance (see [2]).

callback_selector : callback function selector provided by the caller. The WEB Interface FCM will use this call back function to pass the WEB response message according to the WEB protocol : HTTP for instance (see [2]) to the client's requester.

Description

This function allows a software element client (or WEB client) to send a request to a WEB server according to the WEB protocol (HTTP for instance).

Return value

SUCCESS (0)
EALLOC (1) : resource allocation error.

(b) WEBInterface::ClientCallback

Prototype

```
void WEBInterface::ClientCallback     (
                    in request_id,
                    in sequence <byte> web_response,
                    )
```

Parameters

request_id : this parameter identified the corresponding WEB request issued by the called client.

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web_response : contains the complete WEB response or a part of WEB response from a WEB server due to a previous request identified by the **request_id** parameter.

Description

This primitive is implemented within the client software element. It will be called by the WEB interface software element to send the response or part of the response due to a previous request.

Return value

No value

According to another aspect of the network of the present embodiment, this network includes a device called a 'residential gateway'. A residential gateway is a device that connects an external access network (broadcast cable or satellite delivery system, telco network) to the home network. It provides the home terminals with a common abstraction of the service provider. In other words, the residential gateway isolates and concentrates everything being service provider dependent. It allows any home terminal to access the external network. A residential gateway may contain a POTS modem, an ISDN adapter, a cable modem, a DBS decoder, or similar devices.

An access network return channel abstraction is provided. This abstraction is realized through a software service called RC software service (whose type is RETURN_CHANNEL). It is used to access any return channel, using the same set of messages.

The RC software service provides an abstraction of the access network return channel through an uniform API (HAVI).

The RC software service maps the HAVI interface it processes with another software service onto the physical topology of the access network return channel.

The RC HAVI API (Application programmable interface) is used by any other software service of the home network when it wants to communicate on the access network independently of its physical topology (PSTN, ISDN, DECT, cable rc, ...).

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The HAVI API is a message level API. Messages are exchanged between the RC software service and another software service (called afterwards the client). The API described hereafter is given as an example of what the API may look like.

Open (E164Address)

This message is sent by a client software element to the RC, when it wants to open a communication.

OutgoingData(DataPayload)

This message is sent by the client software element to the RC and carries data to be put to the external network.

IncomingData(DataPayload)

This message is sent by the RC to the client software element and contains data received from the access network return channel.

Close(E164Address)

This message may be sent either by the RC or the client software element, and means the communication is closed.

Figure 2 gives an example of communications between software elements during the establishment of an interactive application from a private Electronic Program Guide.

The presence of FAVs in the home network allows the home network to integrate LAV residential gateways, with a return channel that were not providing the HAVI interface. In that case a proxy SCM is used to directely talk with the residential gateway return channel.

An access network return channel may also provide functions that are not contained in the HAVI API. In that case a SCM may also be used to integrate these new functions in the home network.

Cited documents:

[1] The HAVi architecture version 0.8.

[2] Hypertext Transfer Protocol / 1.1 RFC 2068

Abbreviations:

base AV device
(BAV)
A HAVi-compliant device containing HAVi SDD data but not running any of the software elements of the HAVi Architecture.

---

controller A device which controls other devices. An IAV or FAV device.

data driven interaction (DDI)
A HAVi mechanism allowing control of software elements, e.g. DCMs, via user interface elements such as buttons and icons.

DDI controller A software entity which renders DDI elements and handles user interaction.

DDI element The DDI encoding of a user interface element.

DDI protocol The HAVi messages supporting data driven interaction.

device A physical entity attached to the home network, examples are video players, recorders, cameras, CD and DVD players, set-top boxes, DTV receivers, and PCs.

device control application A HAVi software element allowing user control of a specific device (and its functional components). Installed on request and possibly on a different controller than the one on which the DCM is installed.

device control module (DCM)
A HAVi software element providing an interface for controlling general functions of a device.

DCM code unit A HAVi bytecode unit to be loaded and installed on a FAV, or a proprietary code unit to be installed on a FAV or IAV.

Installation of a DCM code unit results in one DCM and one or more FCMs and possibly one device control application.

embedded DCM A DCM implemented in native (i.e., platform dependent) code. Embedded DCMs typically run on IAV devices.

full AV device (FAV)

A HAVi-compliant device which runs the software elements of the HAVi Architecture including a HAVi bytecode runtime.

functional component An abstraction within the HAVi Architecture that represents a group of related functions associated with a device. For example a DTV receiver may consist of several functional components: tuner, decoder, audio amplifier, etc.

functional component module (FCM)

A HAVi software element providing an interface for controlling a specific functional component of a device.

global unique ID
(GUID)

A 64-bit quantity used to uniquely identify an IEEE 1394 device. Consists of a 24-bit company ID (obtained from the 1394 Registration Authority Committee) and a 40-bit serial number assigned by the device manufacturer. The GUID is stored in a device's configuration ROM and is persistent over 1394 network resets.

HAVi Architecture The HAVi Architecture comprises the messaging model, control model, device model, and execution environment defined in this document.

HAVi bytecode A portable code representation used by uploaded DCMs and possibly by applications. FAV devices contain a runtime environment for loading and executing HAVi bytecode. HAVi bytecode is not yet specified but will be selected from existing candidates.

HAVi-compliant device A device supporting IEEE 1394, IEC 61883 and conforming to the HAVi Architecture specification for an FAV, IAV or BAV device.

HAVi level 1 interoperability Refers to the features provided by IAVs and embedded DCMs.

HAVi level 2 interoperability Refers to the features provided by FAVs anduploaded DCMs.

HAVi SDD data Self Describing Device (SDD) data is stored in the IEEE 1212 Configuration ROM found on 1394 devices. HAVi specifies SDD data items that may be used for DDI elements or uploaded DCMs.

HAVi unique ID (HUID)

A unique identification of devices and their functional components. Persistent over changes in network configuration (i.e., device plug-in or plug-out).

home network The home network is the generic name used to define the communications infrastructure within the home. This name is used as an abstraction from the physical media and associated protocols. A home network supports both the exchange of control information and the exchange of AV content.

intermediate AV device (IAV)

A HAVi-compliant device which runs the software elements of the HAVi Architecture but does not include a HAVi bytecode runtime environment.

legacy AV device (LAV)

A non HAVi-compliant device.

software element A HAVi object. A software element responds to a set of messages specified by the API for that element.

software element ID (SEID)

A 80-bit value used to identify software elements. Not guaranteed to be persistent over changes in network configuration (i.e., device plug-in or plug-out).

uploaded DCM A DCM implemented in HAVi bytecode. Uploaded DCMs run only on FAV devices.

HAVi Acronyms

BAV Base AV device
DCM Device Control Module
DDI Data Driven Interaction
FAV Full AV device
FCM Functional Component Module
HUID HAVi Unique ID
IAV Intermediate AV device
LAV Legacy AV device
SEID Software Element Identifier

Other Acronyms

1394, IEEE 1394 IEEE std 1394/1995
API Application Programming Interface
AV/C Audio/Video Control Command and Transaction Set (AV/C-CTS) specified by the 1394 Trade Association
CE Consumer Electronics
DTV Digital TV
DV Digital Video, the consumer version of DVC
DVC Digital Video Cassette
DVD Digital Video/Versatile Disc
DVR Digital Video Recorder
EPG Electronic Program Guide
GUI Graphical User Interface
GUID Global Unique Identifier
IR infrared
SDD Self Describing Device
STB Set-top Box

Claims

1. Method for accessing Internet services in a home network system comprising devices connected by a communication bus, said method comprising the steps of

providing at least one device including a WEB interface, said device comprising an IP stack,

- making said WEB interface accessible to software element clients of other devices in said network through an application programmable interface.

2. Method according to claim 1, wherein said WEB interface splits responses to queries from software element clients into data packets corresponding to the memory capacity of said software element clients.

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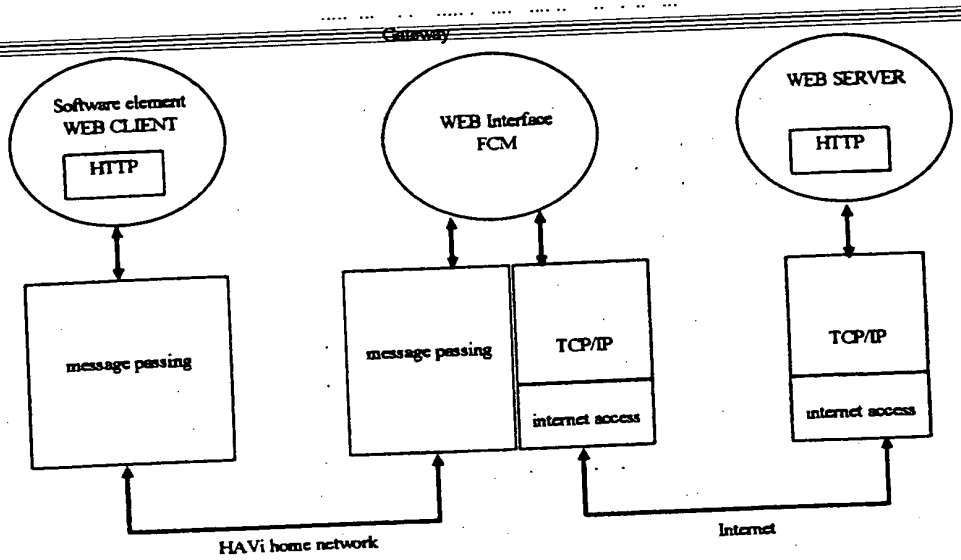
Gateway
Software element
WEB CLIENT
HTTP
message passing
WEB Interface
FCM
message passing
TCP/IP
internet access
WEB SERVER
HTTP
TCP/IP
internet access
HAVi home network
Internet

Fig. 1

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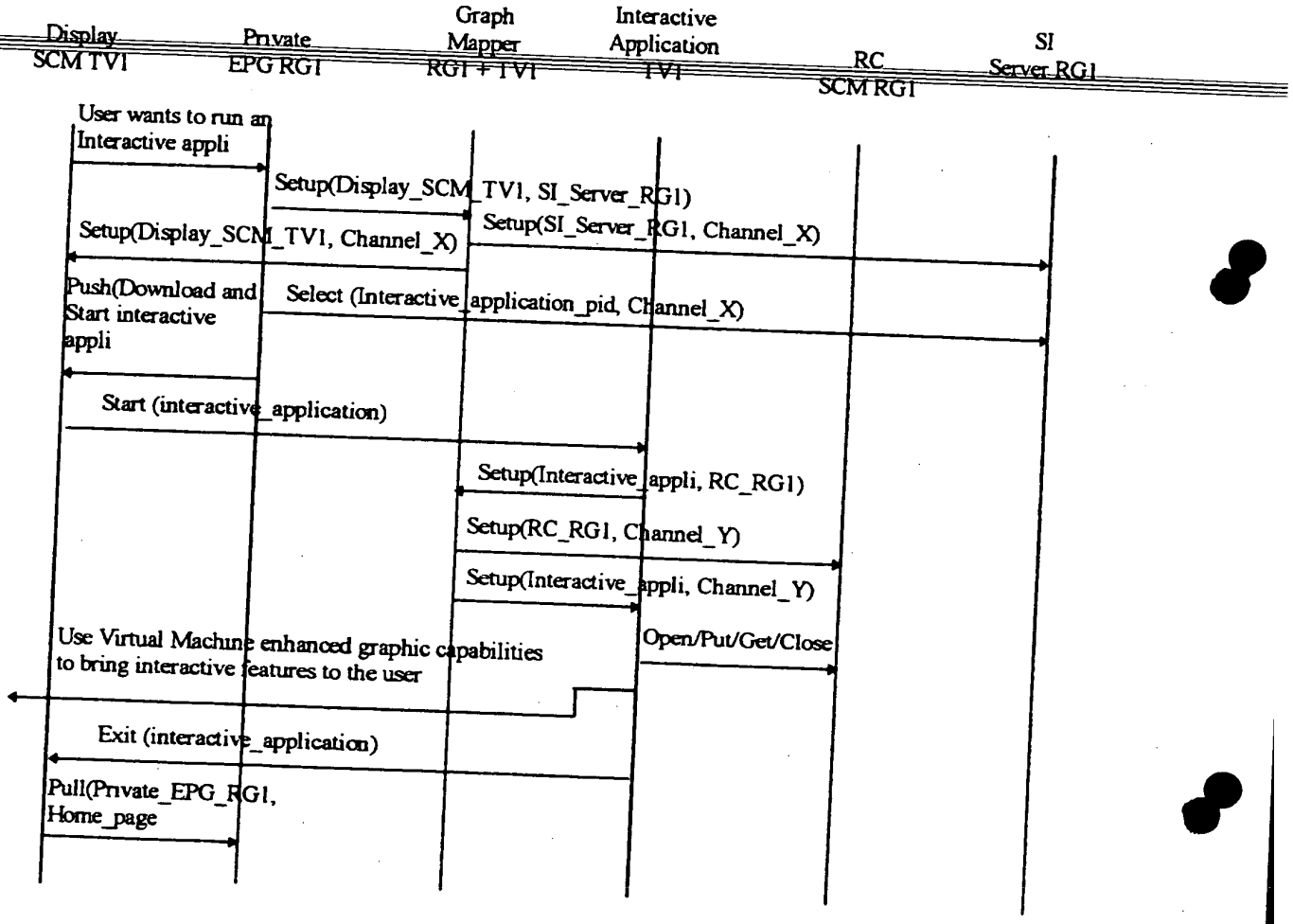
Display SCM TV1
Private EPG RG1
Graph Mapper RG1 + TV1
Interactive Application TV1
RC SCM RG1
SI Server RG1
User wants to run an Interactive appli
Setup(Display_SCM_TV1, SI_Server_RG1)
Setup(SI_Server_RG1, Channel_X)
Setup(Display_SCM_TV1, Channel_X)
Push(Download and Start interactive appli
Select (Interactive_application_pid, Channel_X)
Start (interactive_application)
Setup(Interactive_appli, RC_RG1)
Setup(RC_RG1, Channel_Y)
Setup(Interactive_appli, Channel_Y)
Use Virtual Machine enhanced graphic capabilities to bring interactive features to the user
Open/Put/Get/Close
Exit (interactive_application)
Pull(Private_EPG_RG1, Home_page

Fig. 2

08-06-1998

ABST

Abstract

The invention concerns method for accessing Internet services in a home network system comprising devices connected by a communication bus, said method comprising the steps of

- providing at least one device including a WEB interface, said device comprising an IP stack,
- making said WEB interface accessible to software element clients of other devices in said network through an application programmable interface.

The invention applies to home networks.

Fig. 1

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